HARDWARE REFERENCE MANUAL

TURBO PMAC2 VME

Programmable Multi-Axis Controller

4Ax-602413-xHxx

May 26, 2004

DELTA TAU
Data Systems, Inc.
NEW IDEAS IN MOTION ...

Single Source Machine Control *Power // Flexibility // Ease of Use*
21314 Lassen Street Chatsworth, CA 91311 // Tel. (818) 998-2095 Fax. (818) 998-7807 // www.deltatau.com

Copyright Information

© 2003 Delta Tau Data Systems, Inc. All rights reserved.

This document is furnished for the customers of Delta Tau Data Systems, Inc. Other uses are unauthorized without written permission of Delta Tau Data Systems, Inc. Information contained in this manual may be updated from time-to-time due to product improvements, etc., and may not conform in every respect to former issues.

To report errors or inconsistencies, call or email:

Delta Tau Data Systems, Inc. Technical Support
Phone: (818) 717-5656
Fax: (818) 998-7807
Email: support@deltatau.com
Website: http://www.deltatau.com

Operating Conditions

All Delta Tau Data Systems, Inc. motion controller products, accessories, and amplifiers contain static sensitive components that can be damaged by incorrect handling. When installing or handling Delta Tau Data Systems, Inc. products, avoid contact with highly insulated materials. Only qualified personnel should be allowed to handle this equipment.

In the case of industrial applications, we expect our products to be protected from hazardous or conductive materials and/or environments that could cause harm to the controller by damaging components or causing electrical shorts. When our products are used in an industrial environment, install them into an industrial electrical cabinet or industrial PC to protect them from excessive or corrosive moisture, abnormal ambient temperatures, and conductive materials. If Delta Tau Data Systems, Inc. products are exposed to hazardous or conductive materials and/or environments, we cannot guarantee their operation.

Table of Contents

INTRODUCTION **1**
Board Configuration 1
Base Version *1*
Option 1: Additional Four Channels Axis Interface Circuitry *1*
Option 2: Dual-Ported RAM *2*
Option 5: CPU and Memory Configurations *2*
Option 7: Plate Mounting *2*
Option 8: High-Accuracy Clock Crystal *2*
Option 9: Serial Port Configuration *2*
Option 10: Firmware Version Specification *3*
Option 12: Analog-to-Digital Converters *3*
Option 16: Battery-Backed Parameter Memory *3*
Option 18: Identification Number and Real Time Clock/Calendar Module *3*

CPU BOARD E-POINT DESCRIPTIONS **5**
E1: Watchdog Disable Jumper 5
E2-E3: Expansion Port Configure 5
E4 – E6: Power-Up/Reset Load Source 5
E7: Firmware Reload Enable 5

BOTTOM BOARD E-POINT JUMPER DESCRIPTIONS **7**
E1: Servo and Phase Clock Direction Control 7
E2: (Reserved for Future Use) 7
E3: Normal/Re-Initializing Power-Up/Reset 7
E4 – E6: (Reserved for Future Use) 7
E7A-H, E8A-H, E9A-H, E10A-H: P2 Connector B-Row Use Select 7
E11 – E12: Compare Output Supply Voltage Configure 8
E13 - E14: Encoder Sample Clock Direction Control 8
E17 - E18: Serial Connector Select 8
E20A-I: DPRAM Byte Order Control 9
E39: Reset-from-Bus Enable 9

OPTION 1V PIGGYBACK JUMPER DESCRIPTION **11**
JP1-1 to JP1-32: P2A Connector B-Row Use Select 11
E14: SCLK Direction Control 11

MATING CONNECTORS **13**
CPU Board Connectors 13
J2 (JEXP)/Expansion *13*
J4 (JDPRAM)/Dual-Ported RAM *13*
Base Board Connectors 13
J1 (JANA)/Analog (Option 12) *13*
J2 (JTHW)/Multiplexer Port *13*
J3 (JIO)/Digital I/O *13*
J4 (JMACRO)/Macro Digital Data *13*
J5 (JRS232)/RS-232 Serial Communications *13*
J5A (JRS422)/RS-422 Serial Communications *13*
J6 (JDISP)/Display *13*
J7 (JHW)/Auxiliary Channel *14*
J8 (JEQU)/Position Compare *14*
J9 (JMACH1)/Machine Port 1 ..... *14*
J10 (JMACH2)/Machine Port 2 ..... *14*
P1 (PVME)/Main VME Bus Connector *14*
P2 (PMACH)/Alternate Machine Port/Extended VME *14*

Option 1V Axis Piggyback Connectors....14
J11 (JMACH3)/ Machine Port 3 ....*14*
J12 (JMACH4)/ Machine Port 4 ....*14*
P2A (PMACHA)/Alternate Machine Port *14*

BASE BOARD CONNECTOR PINOUTS....15
J1 (JANA) Analog Input Port Connector 15
J2 (JTHW) Multiplexer Port Connector 16
J3 (JI/O) General Input/Output Connector 17
J4 (JMACRO) MACRO Network Ring Interface Connector....18
J5 (JRS232) Serial Port Connector....18
J5A: RS422 Serial Port Connector 19
J6 (JDISP) Display Connector....20
J7 (JHW) Handwheel Encoder Connector 20
J8 (JEQU) Position Compare Output Connector....21
J9 (JMACH1) Machine Connector....21
J10 (JMACH2) Machine Connector....24
P1 (JVME) VME Bus Connector 27
P2 (JMACHA) Alternate Machine Connector 28
TB1 (2/4-Pin Terminal Block) 29
TB2 (4-Pin Terminal Block)....29

AXIS PIGGYBACK BOARD CONNECTOR DESCRIPTIONS....31
J11 (JMACH3) Machine Connector....31
J12 (JMACH4) Machine Connector....34
P2A (JMACHB) Alternate Machine Connector....37

INTRODUCTION

The Turbo PMAC2 VME is a member of the Turbo PMAC family of boards optimized for interface to sinewave or direct PWM servo drives and to pulse-and-direction stepper drives. Its software is capable of 32 axes of control. It can have up to eight channels of on-board axis interface circuitry. It can also support up to 32 channels of off-board axis interface circuitry through its expansion port, connected to Acc-24P or Acc-24P2 boards.

The Turbo PMAC2 VME is a full-sized ISA-bus expansion card, with a small piggyback board containing the CPU board. This piggyback board occupies part of the next slot, but ½-sized boards are permitted in this next slot. While the Turbo PMAC2 VME is capable of ISA bus communications, with or without the optional on-board dual-ported RAM, it does not need to be inserted into an ISA expansion slot. Communications can be done through an RS-232 or optional RS-422 serial port; standalone operation is possible.

Board Configuration

Base Version

The base version of the Turbo PMAC2 VME provides a 2-slot board with:

- 80 MHz DSP56303 CPU (120 MHz PMAC equivalent)
- 128k x 24 SRAM compiled/assembled program memory (5C0)
- 128k x 24 SRAM user data memory (5C0)
- 1M x 8 flash memory for user backup & firmware (5C0)
- Latest released firmware version
- RS-232 serial interface, VME bus interface
- 1 16-node MACRO interface IC
- Four channels axis interface circuitry, each including:
  - Three output command signal sets, configurable as either:
    - Two serial data streams to external DACs, 1 pulse-and-direction
    - Three PWM top-and-bottom pairs
  - 3-channel differential/single-ended encoder input
  - Nine input flags, two output flags
  - Interface to two external serial ADCs, 8 to 18 bits
- Two channels supplemental interface circuitry, each including:
  - 2-channel differential/single-ended encoder input
  - One output command signal set, configurable as pulse-and-direction or PWM top-and-bottom pair
- Display, MACRO, muxed I/O, direct I/O interface ports
- PID/notch/feedforward servo algorithms
- Extended "pole-placement" servo algorithms
- 1-year warranty from date of shipment
- One manual per set of one to four PMACs in shipment
  (Cables, mounting plates, mating connectors not included)

Option 1: Additional Four Channels Axis Interface Circuitry

- Option 1V provides an additional four channels of axis interface circuitry on a small piggyback board, identical to the standard first four channels on the base board.

Option 2: Dual-Ported RAM

Dual-ported RAM provides a high speed communications path for bus communications with the host computer through a bank of shared memory. DPRAM is advised if more than about 100 data items per second are to be passed between the controller and the host computer in either direction.

Option 2V provides an 8k x 16 bank of dual-ported RAM. The key component on the board is U87.

Option 5: CPU and Memory Configurations

The various versions of Option 5 provide different CPU speeds and main memory sizes on the piggyback CPU board. Only one Option 5xx may be selected for the board.

The CPU is a DSP5630x IC as component U1. Currently, it is available only as an 80 MHz device (with computational power equivalent to a 120 MHz non-Turbo PMAC), but higher speed versions will be available shortly.

The compiled/assembled-program memory SRAM ICs are located in U14, U15, and U16. These ICs form the active memory for the firmware, compiled PLCs, and user-written phase/servo algorithms. These can be 128k x 8 ICs (for a 128k x 24 bank), fitting in the smaller footprint, or they can be the larger 512k x 8 ICs (for a 512k x 24 bank), fitting in the full footprint.

The user-data memory SRAM ICs are located in U11, U12, and U13. These ICs form the active memory for user motion programs, uncompiled PLC programs, and user tables and buffers. These can be 128k x 8 ICs (for a 128k x 24 bank), fitting in the smaller footprint, or they can be the larger 512k x 8 ICs (for a 512k x 24 bank), fitting in the full footprint.

The flash memory IC is located in U10. This IC forms the non-volatile memory for the board's firmware, the user setup variables, and for user programs, tables, and buffers. It can be 1M x 8, 2M x 8, or 4M x 8 in capacity.

- Option 5C0 is the standard CPU and memory configuration. It is provided automatically if no Option 5xx is specified. It provides an 80 MHz CPU (120 MHz PMAC equivalent), 128k x24 of compiled/assembled program memory, 128k x 24 of user data memory; and a 1M x 8 flash memory.
- Option 5C1 provides an 80 MHz CPU (120 MHz PMAC equivalent), 128k x 24 of compiled/assembled program memory, an expanded 512k x 24 of user data memory, and a 2M x 8 flash memory.
- Option 5C2 provides an 80 MHz CPU (120 MHz PMAC equivalent), an expanded 512k x 24 of compiled/assembled program memory, 128k x 24 of user data memory, and a 2M x 8 flash memory.
- Option 5C3 provides an 80 MHz CPU (120 MHz PMAC equivalent), an expanded 512k x 24 of compiled/assembled program memory, an expanded 512k x 24 of user data memory, and a 4M x 8 flash memory.

Option 7: Plate Mounting

- Option 7 provides a mounting plate connected to the PMAC with standoffs. It is used to install the PMAC in standalone applications.

Option 8: High-Accuracy Clock Crystal

The Turbo PMAC2 VME has a clock crystal (component Y1) of nominal frequency 19.6608 MHz (~20 MHz). The standard crystal's accuracy specification is +/-100 ppm.

- Option 8A provides a nominal 19.6608 MHz crystal with a +/-15 ppm accuracy specification.

Option 9: Serial Port Configuration

The Turbo PMAC2 VME comes standard with a single serial port, which can be used in either RS-232 or RS-422 format. Optionally, a second independent serial port may be added.

- Option 9T adds an auxiliary RS-232 port on the CPU piggyback board. The key components added are IC U22 and connector J8 on the CPU board.

Option 10: Firmware Version Specification

Normally, the Turbo PMAC2 VME is provided with the newest released firmware version. A label on the U10 flash memory IC shows the firmware version loaded at the factory.

- Option 10 provides for a user-specified firmware version.

Option 12: Analog-to-Digital Converters

Option 12 permits the installation of 8 or 16 channels of on-board multiplexed analog-to-digital converters. One or two of these converters are read every phase interrupt. The analog inputs are not optically isolated, and each can have a 0 – 5V input range, or a +/-2.5V input range, individually selectable.

- Option 12 provides an 8-channel 12-bit A/D converter. The key components on the board are U28 and connector J1.
- Option 12A provides an additional 8-channel 12-bit A/D converter. The key component on the board is U29.

Option 16: Battery-Backed Parameter Memory

The contents of the standard memory are not retained through a power-down or reset unless they have been saved to flash memory first. Option 16 provides supplemental battery-backed RAM for real-time parameter storage that is ideal for holding machine state parameters in case of an unexpected power-down. The battery is located at component BT1.

- Option 16A provides a 32k x 24 bank of battery-backed parameter RAM in components U17, U18, and U19 on the CPU board, fitting in the smaller footprint for those locations.
- Option 16B provides a 128k x 24 bank of battery-backed parameter RAM in components U17, U18, and U19 on the CPU board, filling the full footprint for those locations.

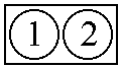
Option 18: Identification Number and Real Time Clock/Calendar Module

Option 18 provides a module at location U5 on the CPU board that contains an electronic identification number and possibly a real-time clock/calendar.

- Option 18A provides an electronic identification number module.
- Option 18B provides an electronic identification number module with a real-time clock and calendar. The year representation in the calendar is a 4-digit value, so there are no Year 2000 problems.

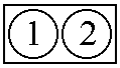
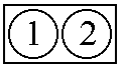
CPU BOARD E-POINT DESCRIPTIONS

E1: Watchdog Disable Jumper

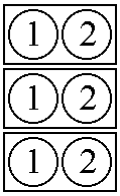
E Point and Physical Layout	Description	Default
E1  	Jump pin 1 to 2 to disable Watchdog timer (for test purposes only). Remove jumper to enable Watchdog timer.	No jumper installed

E2-E3: Expansion Port Configure

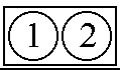
(Prototype boards {-104 and earlier} only)

E Point and Physical Layout	Description	Default
E2  	Jump pin 1 to 2 to permit use of Acc-24 expansion boards. Remove jumper to permit use of unmodified (pin 41 intact) Option 2 DPRAM board	Jumper installed
E3  	Jump pin 1 to 2 to permit use of Acc-24 expansion boards. Remove jumper to permit use of unmodified (pin 42 intact) Option 2 DPRAM board	Jumper installed
Note: Production versions of the Turbo CPU board are built with circuit traces providing the equivalent of E2 and E3 ON. To use with an Option 2 DPRAM board, pins 41 and 42 on the 50-pin connector of the Option 2 board must be clipped in order to be able to operate properly. All Option 2 boards built since Turbo PMAC production began have been built with these pins clipped.		

E4 – E6: Power-Up/Reset Load Source

E Point and Physical Layout	Description	Default
E4  **E6**	Remove jumper E4; jump E5 pin 1 to 2; jump E6 pin 2 to 3; to read flash IC on power-up/reset. Other combinations are for factory use only; the board will not operate in any other configuration	No E4 jumper installed; E5 and E6 jump pin 1 to 2

E7: Firmware Reload Enable

E Point and Physical Layout	Description	Default
E7  	Jump pin 1 to 2 to reload firmware through serial or bus port Remove jumper for normal operation.	No jumper installed

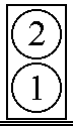
BOTTOM BOARD E-POINT JUMPER DESCRIPTIONS

E1: Servo and Phase Clock Direction Control

E Point and Physical Layout	Description	Default
E1	Remove jumper for Turbo PMAC2 VME to use its internally generated servo and phase clock signals and to output these signals on the J5x serial port connector Jump pins 1 and 2 for Turbo PMAC2 VME to expect to receive its servo and phase clock signals on the J5x serial port connector.	No jumper
Note: If the E1 jumper is ON and the servo and phase clocks are not brought in on the J4 serial port, the watchdog timer will trip immediately.		

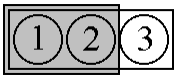
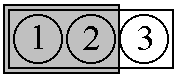
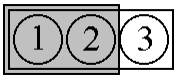
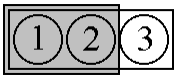
E2: (Reserved for Future Use)

E3: Normal/Re-Initializing Power-Up/Reset

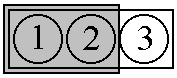
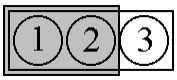
E Point and Physical Layout	Location	Description	Default
E51 	A2	Jump pin 1 to 2 to re-initialize ON power-up/reset. Remove jumper for Normal power-up/reset.	No jumper installed

E4 – E6: (Reserved for Future Use)

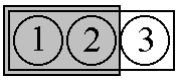
E7A-H, E8A-H, E9A-H, E10A-H: P2 Connector B-Row Use Select

E Point and Physical Layout	Location	Description	Default
E7A-H 		Jump pins 1 to 2 to use B-row of P2 connector for JMACH pins (not compatible with 32-bit VME). Jump pins 2 to 3 to use B-row of P2 connector for 32-bit VME bus interface	1-2 Jumpers installed
E8A-H 		Jump pins 1 to 2 to use B-row of P2 connector for JMACH pins (not compatible with 32-bit VME). Jump pins 2 to 3 to use B-row of P2 connector for 32-bit VME bus interface.	1-2 Jumpers installed
E9A-H 		Jump pins 1 to 2 to use B-row of P2 connector for JMACH pins (not compatible with 32-bit VME). Jump pins 2 to 3 to use B-row of P2 connector for 32-bit VME bus interface.	1-2 Jumpers installed
E10A-H 		Jump pins 1 to 2 to use B-row of P2 connector for JMACH pins (not compatible with 32-bit VME). Jump pins 2 to 3 to use B-row of P2 connector for 32-bit VME bus interface.	1-2 Jumpers installed (32-bit VME)
Note: All jumpers in the E7 to E10 families must be in the same setting.			

E11 – E12: Compare Output Supply Voltage Configure

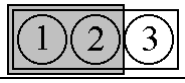
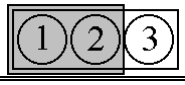
E Point and Physical Layout	Location	Description	Default
E11 	D3	Jump pin 1 to 2 to apply +V (+5V to 24V) to pin 11 of U74 (should be ULN2803A for sink output configuration) JEQU Compare outputs EQU1-EQU8. Jump pin 2 to 3 to apply GND to pin 11 of U74 (should be UDN2981A for source output configuration). ***WARNING:*** The jumper setting must match the type of driver IC, or damage to the IC will result.	1-2 Jumper installed
E12 	C3	Jump pin 1 to 2 to apply GND to pin 10 of U74 (should be ULN2803A for sink output configuration). Jump pin 2 to 3 to apply +V (+5V to 24V) to pin 10 of U74 (should be UDN2981A for source output configuration). ***WARNING:*** The jumper setting must match the type of driver IC, or damage to the IC will result.	1-2 Jumper installed

E13 - E14: Encoder Sample Clock Direction Control

E Point and Physical Layout	Location	Description	Default
E13 		Remove jumper to output SCLK generated in first ASIC on SCLK_12 and SCLK_34, or to control direction by software. Jump pins 1 to 2 to input SCLK signal for first ASIC on SCLK_34 and output this signal on SCLK_12. Jump pins 2 to 3 to input SCLK signal for first ASIC on SCLK_12 and output this signal on SCLK_34.	No jumper installed

E17 - E18: Serial Connector Select

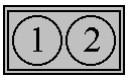
E17 and E18 control whether the RS-232 or RS-422 serial port is used.

E Point and Physical Layout	Location	Description	Default
E17 		Jump pins 1 to 2 to use RS-232 serial interface. Jump pins 2 to 3 to use RS-422 serial interface.	1-2 Jumper installed
E18 		Jump pins 1 to 2 to use RS-232 serial interface. Jump pins 2 to 3 to use RS-422 serial interface.	1-2 Jumper installed

E20A-I: DPRAM Byte Order Control

E Point and Physical Layout	Location	Description	Default
E20A-I 5 (4 3) (2 1) 5 (4 3) (2 1) 5 (4 3) (2 1) 5 (4 3) (2 1) 5 (4 3) (2 1) 5 (4 3) (2 1) 5 (4 3) (2 1) 5 (4 3) (2 1) 5 (4 3) (2 1)		Jump pins 1 to 2 and pins 3 to 4, to tie DPRAM data lines 8-15 to VMEbus data lines 8-15, and DPRAM data lines 0-7 to VMEbus data lines 0-7 (Motorola big-endian format). Jump pins 2 to 3 and pins 4 to 5 to tie DPRAM data lines 8-15 to VMEbus data lines 0-7, and DPRAM data lines 0-7 to VMEbus data lines 8-15 (Intel little-endian format).	1-2, 3-4 Jumpers installed (Motorola format)
All E20A-I jumpers must be in the same setting for DPRAM communications to work.			

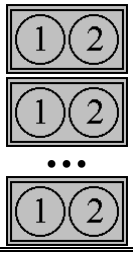
E39: Reset-from-Bus Enable

E Point and Physical Layout	Location	Description	Default
E39 	B5	Jump pin 1 to 2 to permit VMEbus reset line to reset PMAC2. Remove jumper so VMEbus reset line does not reset PMAC2.	1-2 Jumper installed

OPTION 1V PIGGYBACK JUMPER DESCRIPTION

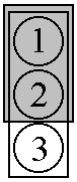
JP1-1 to JP1-32: P2A Connector B-Row Use Select

(Option 1V only)

E Point and Physical Layout	Location	Description	Default
JP1-1 to JP1-32 		Jump pins 1 to 2 to use B-row of P2A connector for JMACH pins (not compatible with 32-bit VME). Remove jumpers to leave B-row of P2A unconnected to prevent contention with 32-bit VMEbus.	1-2 Jumpers installed

E14: SCLK Direction Control

(Option 1V only)

E Point and Physical Layout	Location	Description	Default
E14 		Remove jumper to output SCLK generated in second ASIC on SCLK_56 and SCLK_78, or to control direction by software. Jump pins 1 to 2 to input SCLK signal for second ASIC on SCLK_78 and output this signal on SCLK_56. Jump pins 2 to 3 to input SCLK signal for second ASIC on SCLK_56 and output this signal on SCLK_78.	No jumper installed

MATING CONNECTORS

CPU Board Connectors

J2 (JEXP)/Expansion

1. Two 50-pin female flat cable connector Delta Tau P/N 014-R00F50-0K0 T&B Ansley P/N 609-5041
2. 171-50 T&B Ansley standard flat cable stranded 50-wire
3. Phoenix varioface module type FLKM 50 (male pins) P/N 22 81 08 9 used for daisy chaining Acc-14 I/0, -23 A and D connectors -24 expansion

J4 (JDPRAM)/Dual-Ported RAM

1. Two 10-pin female flat cable connector Delta Tau P/N 014-ROOF10-0K0 T&B Ansley P/N 609-1041
2. 171-10 T&B Ansley standard flat cable stranded 10-wire
3. Phoenix varioface module type FLKM 10 (male pins) P/N 22 81 01 8

Base Board Connectors

J1 (JANA)/Analog (Option 12)

1. Two 14-pin female flat cable connector Delta Tau P/N 014-R00F14-0K0 T&B Ansley P/N 609-1441
2. 171-14 T&B Ansley standard flat cable stranded 14-wire
3. Phoenix varioface modules type FLKM14 (male pins) P/N 22 81 02 1

J2 (JTHW)/Multiplexer Port

1. Two 26-pin female flat cable connector Delta Tau P/N 014-R00F26-0K0 T&B Ansley P/N 609-2641
2. 171-26 T&B Ansley standard flat cable stranded 26-wire
3. Phoenix varioface module type FLKM 26 (male pins) P/N 22 81 05 0

J3 (JIO)/Digital I/O

1. Two 40-pin female flat cable connector Delta Tau P/N 014-R00F40-0K0 T&B Ansley P/N 609-4041
2. 171-40 T&B Ansley standard flat cable stranded 40-wire
3. Phoenix varioface module type FLKM 40 (male pins)

J4 (JMACRO)/Macro Digital Data

1. Two 26-pin female flat cable connector Delta Tau P/N 014-R00F26-0K0 T&B Ansley P/N 609-2641
2. 171-26 T&B Ansley standard flat cable stranded 26-wire
3. Phoenix varioface module type FLKM 26 (male pins) P/N 22 81 05 0

J5 (JRS232)/RS-232 Serial Communications

1. Two 10-pin female flat cable connector Delta Tau P/N 014-ROOF10-0K0 T&B Ansley P/N 609-1041
2. 171-10 T&B Ansley standard flat cable stranded 10-wire
3. Phoenix varioface module type FLKM 10 (male pins) P/N 22 81 01 8

J5A (JRS422)/RS-422 Serial Communications

1. Two 26-pin female flat cable connector Delta Tau P/N 014-R00F26-0K0 T&B Ansley P/N 609-2641
2. 171-26 T&B Ansley standard flat cable stranded 26-wire
3. Phoenix varioface module type FLKM 26 (male pins) P/N 22 81 05 0

J6 (JDISP)/Display

1. Two 14-pin female flat cable connector Delta Tau P/N 014-R00F14-0K0 T&B Ansley P/N 609-1441
2. 171-14 T&B Ansley standard flat cable stranded 14-wire
3. Phoenix varioface modules type FLKM14 (male pins) P/N 22 81 02 1

J7 (JHW)/Auxiliary Channel

1. Two 20-pin female flat cable connector Delta Tau P/N 014-R00F20-0K0 T&B Ansley P/N 609-2041
2. 171-20 T&B Ansley standard flat cable stranded 20-wire
3. Phoenix varioface modules type FLKM20 (male pins)

J8 (JEQU)/Position Compare

1. Two 10-pin female flat cable connector Delta Tau P/N 014-ROOF10-0K0 T&B Ansley P/N 609-1041
2. 171-10 T&B Ansley standard flat cable stranded 10-wire
3. Phoenix varioface module type FLKM 10 (male pins) P/N 22 81 01 8

J9 (JMACH1)/Machine Port 1

1. Two 100-pin high-density flat-cable connector
2. High-density flat cable stranded 100-wire

J10 (JMACH2)/Machine Port 2

1. Two 100-pin high-density flat-cable connector
2. High-density flat cable stranded 100-wire

P1 (PVME)/Main VME Bus Connector

1. 96-pin VME/DIN connector AMLAN P/N C96F3LA+B+C

P2 (PMACH)/Alternate Machine Port/Extended VME

1. 96-pin VME/DIN connector AMLAN P/N C96F3LA+B+C

Option 1V Axis Piggyback Connectors

J11 (JMACH3)/ Machine Port 3

1. Two 100-pin high-density flat-cable connector
2. High-density flat cable stranded 100-wire

J12 (JMACH4)/ Machine Port 4

1. Two 100-pin high-density flat-cable connector
2. High-density flat cable stranded 100-wire

P2A (PMACHA)/Alternate Machine Port

1. 96-pin VME/DIN connector. AMLAN P/N C96F3LA+B+C

BASE BOARD CONNECTOR PINOUTS

J1 (JANA) Analog Input Port Connector

(Present only if Option 12 ordered)

Pin #	Symbol	Function	Description	Notes
1	ANAI00	Input	Analog Input 0	0-5V or +/-2.5V Range
2	ANAI01	Input	Analog Input 1	0-5Vor +/-2.5V Range
3	ANAI02	Input	Analog Input 2	0-5V or +/-2.5V Range
4	ANAI03	Input	Analog Input 3	0-5V or +/-2.5V Range
5	ANAI04	Input	Analog Input 4	0-5V or +/-2.5V Range
6	ANAI05	Input	Analog Input 5	0-5V or +/-2.5V Range
7	ANAI06	Input	Analog Input 6	0-5V or +/-2.5V Range
8	ANAI07	Input	Analog Input 7	0-5V or +/-2.5V Range
9	ANAI08	Input	Analog Input 8	0-5V or +/-2.5V Range
10	ANAI09	Input	Analog Input 9	0-5V or +/-2.5V Range
11	ANAI10	Input	Analog Input 10	0-5V or +/-2.5V Range
12	ANAI11	Input	Analog Input 11	0-5V or +/-2.5V Range
13	ANAI12	Input	Analog Input 12	0-5V or +/-2.5V Range
14	ANAI13	Input	Analog Input 13	0-5V or +/-2.5V Range
15	ANAI14	Input	Analog Input 14	0-5V or +/-2.5V Range
16	ANAI15	Input	Analog Input 15	0-5V or +/-2.5V Range
17	GND	Common	PMAC Common	Not isolated from digital
18	+12V	Output	Positive Supply Voltage	To power external circuitry
19	GND	Common	PMAC Common	Not isolated from digital
20	-12V	Output	Negative Supply Voltage	To power external circuitry
The JANA connector provides the inputs for the 8 or 16 optional analog inputs on the PMAC2.				

J2 (JTHW) Multiplexer Port Connector

Pin #	Symbol	Function	Description	Notes
1	GND	Common	PMAC Common	
2	GND	Common	PMAC Common	
3	DAT0	Input	Data-0 Input	Data input from MUX port accessories
4	SEL0	Output	Select-0 Output	Address/data output for MUX port accessories
5	DAT1	Input	Data-1 Input	Data input from MUX port accessories
6	SEL1	Output	Select-1 Output	Address/data output for MUX port accessories
7	DAT2	Input	Data-2 Input	Data input from MUX port accessories
8	SEL2	Output	Select-2 Output	Address/data output for MUX port accessories
9	DAT3	Input	Data-3 Input	Data input from MUX port accessories
10	SEL3	Output	Select-3 Output	Address/data output for MUX port accessories
11	DAT4	Input	Data-4 Input	Data input from MUX port accessories
12	SEL4	Output	Select-4 Output	Address/data output for MUX port accessories
13	DAT5	Input	Data-5 Input	Data input from MUX port accessories
14	SEL5	Output	Select-5 Output	Address/data output for MUX port accessories
15	DAT6	Input	Data-6 Input	Data input from MUX port accessories
16	SEL6	Output	Select-6 Output	Address/data output for MUX port accessories
17	DAT7	Input	Data-7 Input	Data input from MUX port accessories
18	SEL7	Output	Select-7 Output	Address/data output for MUX port accessories
19	N.C.	N.C.	No Connection	
20	GND	Common	PMAC Common	
21	BRLD/	Output	Buffer Request	Low is Buffer Request
22	GND	Common	PMAC Common	
23	IPLD/	Output	In Position	Low is In Position
24	GND	Common	PMAC Common	
25	+5V	Output	+5Vdc Supply	Power supply out
26	INIT/	Input	PMAC Reset	Low is Reset

The JTHW connector provides eight inputs and eight outputs at TTL levels; these are dedicated to reading BCD thumbwheel switches. Two thumbwheels may be read by direct connection to J3, more thumbwheels, up to 512 switches, may be read using the Acc-18 (Thumbwheel Multiplexer). J3's inputs and outputs may be used as general purpose multiplexed TTL I/O, if thumbwheels are not used.

J3 (JI/O) General Input/Output Connector

Pin #	Symbol	Function	Description	Notes
1	I/O00	In/Out	Digital I/O 0	Software direction ctrl.
2	I/O01	In/Out	Digital I/O 1	Software direction ctrl.
3	I/O02	In/Out	Digital I/O 2	Software direction ctrl.
4	I/O03	In/Out	Digital I/O 3	Software direction ctrl.
5	I/O04	In/Out	Digital I/O 4	Software direction ctrl.
6	I/O05	In/Out	Digital I/O 5	Software direction ctrl.
7	I/O06	In/Out	Digital I/O 6	Software direction ctrl.
8	I/O07	In/Out	Digital I/O 7	Software direction ctrl.
9	I/O08	In/Out	Digital I/O 8	Software direction ctrl.
10	I/O09	In/Out	Digital I/O 9	Software direction ctrl.
11	I/O10	In/Out	Digital I/O 10	Software direction ctrl.
12	I/O11	In/Out	Digital I/O 11	Software direction ctrl.
13	I/O12	In/Out	Digital I/O 12	Software direction ctrl.
14	I/O13	In/Out	Digital I/O 13	Software direction ctrl.
15	I/O14	In/Out	Digital I/O 14	Software direction ctrl.
16	I/O15	In/Out	Digital I/O 15	Software direction ctrl.
17	I/O16	In/Out	Digital I/O 16	Software direction ctrl.
18	I/O17	In/Out	Digital I/O 17	Software direction ctrl.
19	I/O18	In/Out	Digital I/O 18	Software direction ctrl.
20	I/O19	In/Out	Digital I/O 19	Software direction ctrl.
21	I/O20	In/Out	Digital I/O 20	Software direction ctrl.
22	I/O21	In/Out	Digital I/O 21	Software direction ctrl.
23	I/O22	In/Out	Digital I/O 22	Software direction ctrl.
24	I/O23	In/Out	Digital I/O 23	Software direction ctrl.
25	I/O24	In/Out	Digital I/O 24	Software direction ctrl.
26	I/O25	In/Out	Digital I/O 25	Software direction ctrl.
27	I/O26	In/Out	Digital I/O 26	Software direction ctrl.
28	I/O27	In/Out	Digital I/O 27	Software direction ctrl.
29	I/O28	In/Out	Digital I/O 28	Software direction ctrl.
30	I/O29	In/Out	Digital I/O 29	Software direction ctrl.
31	I/O30	In/Out	Digital I/O 30	Software direction ctrl.
32	I/O31	In/Out	Digital I/O 31	Software direction ctrl.
33	GND	Common	Reference Voltage	
34	GND	Common	Reference Voltage	
35	PHASE/	Output	Phase Clock	For latching data
36	SERVO/	Output	Servo Clock	For latching data
37	GND	Common	Reference Voltage	
38	GND	Common	Reference Voltage	
39	+5V	Output	Supply Voltage	To power external circuitry
40	+5V	Output	Supply Voltage	To power external circuitry
The JI/O connector provides 32 input/output pins at TTL levels. Direction can be controlled in byte-wide groups.				

J4 (JMACRO) MACRO Network Ring Interface Connector

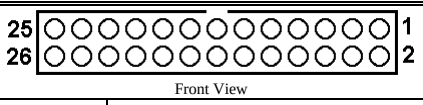
Pin #	Symbol	Function	Description	Notes
1	DOUT7	Output	Ring Out Bit 7	Macro ring command
2	DOUT6	Output	Ring Out Bit 6	Macro ring transmit
3	DOUT5	Output	Ring Out Bit 5	Macro ring transmit
4	DOUT4	Output	Ring Out Bit 4	Macro ring transmit
5	DOUT3	Output	Ring Out Bit 3	Macro ring transmit
6	DOUT2	Output	Ring Out Bit 2	Macro ring transmit
7	DOUT1	Output	Ring Out Bit 1	Macro ring transmit
8	DOUT0	Output	Ring Out Bit 0	Macro ring transmit
9	CMD_IN	Input		
10	DIN7	Input	Ring In Bit 7	Macro ring receive
11	DIN6	Input	Ring In Bit 6	Macro ring receive
12	DIN5	Input	Ring In Bit 5	Macro ring receive
13	DIN4	Input	Ring In Bit 4	Macro ring receive
14	DIN3	Input	Ring In Bit 3	Macro ring receive
15	DIN2	Input	Ring In Bit 2	Macro ring receive
16	DIN1	Input	Ring In Bit 1	Macro ring receive
17	DIN0	Input	Ring In Bit 0	Macro ring receive
18	CMD_OUT	Output		
19	TCLK	Output	Ring Clock	10mHz
20	GND	Common	Reference Voltage	
21	STB_OUT	Output	Byte Strobe	
22	GND	Common	Reference Voltage	
23	DAT_STB	Input	Data Byte Strobe	
24	GND	Common	Reference Voltage	
25	CMD_STB	Input	CMD Byte Strobe	
26	VLTN	Input	Violation Flag	Taxi chip receive error
The JMACRO connector provides the interface to the MACRO driver/receiver accessory board.				

J5 (JRS232) Serial Port Connector

Pin #	Symbol	Function	Description	Notes
1	PHASE	Output	Phasing Clock	
2	DTR	Bidirect	Data Term Ready	Tied to DSR
3	TXD/	Input	Receive Data	Host transmit data
4	CTS	Input	Clear to Send	Host ready bit
5	RXD/	Output	Send Data	Host receive data
6	RTS	Output	Request to Send	PMAC ready bit
7	DSR	Bidirect	Data Set Ready	Tied to DTR
8	SERVO	Output	Servo Clock	
9	GND	Common	PMAC Common	
10	+5V	Output	+5Vdc Supply	Power supply out
The JRS232 connector provides the Turbo PMAC2 VME with the ability to communicate serially with an RS232 port. Jumpers E17 and E18 must both connect pins 1 and 2 to use this port. This connector cannot be used for daisy chain interconnection of multiple PMACs. The J5A RS-422 port is required for daisy chaining.				

J5A: RS422 Serial Port Connector

JRS422 (26-Pin Connector)



Front View

Pin #	Symbol	Function	Description	Notes
1	CHASSI	Common	PMAC Common	
2	S+5V	Output	+5Vdc Supply	Deactivated by E8
3	RD-	Input	Receive Data	Diff. I/O low true **
4	RD+	Input	Receive Data	Diff. I/O high true *
5	SD-	Output	Send Data	Diff. I/O low true **
6	SD+	Output	Send Data	Diff. I/O high true *
7	CS+	Input	Clear to Send	Diff. I/O high true **
8	CS-	Input	Clear to Send	Diff. I/O low true *
9	RS+	Output	Request to Send	Diff. I/O high true **
10	RS-	Output	Request to Send	Diff. I/O low true *
11	DTR	Bidirect	Data Term Read	Tied to DSR
12	INIT/	Input	PMAC Reset	Low is Reset
13	GND	Common	PMAC Common	**
14	DSR	Bidirect	Data Set Ready	Tied to DTR
15	SDIO-	Bidirect	Special Data	Diff. I/O low true
16	SDIO+	Bidirect	Special Data	Diff. I/O high true
17	SCIO-	Bidirect	Special Ctrl.	Diff. I/O low true
18	SCIO+	Bidirect	Special Ctrl.	Diff. I/O high true
19	SCK-	Bidirect	Special Clock	Diff. I/O low true
20	SCK+	Bidirect	Special Clock	Diff. I/O high true
21	SERVO-	Bidirect	Servo Clock	Diff. I/O low true ***
22	SERVO+	Bidirect	Servo Clock	Diff. I/O high true ***
23	PHASE-	Bidirect	Phase Clock	Diff. I/O low true ***
24	PHASE+	Bidirect	Phase Clock	Diff. I/O high true ***
25	GND	Common	PMAC Common	
26	+5V	Output	+5Vdc Supply	Power supply out

The JRS422 connector provides the PMAC with the ability to communicate both in RS422 and RS232. In addition, this connector is used to daisy chain interconnect multiple PMACs for synchronized operation. Jumpers E17 and E18 must both connect pins 2 and 3 to use this port.

J6 (JDISP) Display Connector

Pin #	Symbol	Function	Description	Notes
1	Vdd	Output	+5V Power	Power supply out
2	Vss	Common	PMAC Common	
3	Rs	Output	Read Strobe	TTL signal out
4	Vee	Output	Contrast Adjust Vee	0 to +5Vdc *
5	E	Output	Display Enable	High is enable
6	R/W	Output	Read or Write	TTL signal out
7	DB1	Output	Display Data1	
8	DB0	Output	Display Data0	
9	DB3	Output	Display Data3	
10	DB2	Output	Display Data2	
11	DB5	Output	Display Data5	
12	DB4	Output	Display Data4	
13	DB7	Output	Display Data7	
14	DB6	Output	Display Data6	
The JDISP connector is used to drive the 2-line x 24-character (Acc-12), 2 x 40 (Acc-12A) LCD, or the 2 x 40 vacuum fluorescent (Acc 12C) display unit. The **DISPLAY** command may be used to send messages and values to the display.				

J7 (JHW) Handwheel Encoder Connector

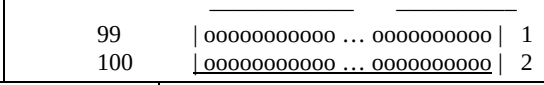
Pin #	Symbol	Function	Description	Notes
1	GND	Common	Reference Voltage	
2	+5V	Output	Supply Voltage	To power external circuitry
3	HWA1+	Input	HW Pos A Chan.	Also pulse input
4	HWA1-	Input	HW Neg A Chan.	Also pulse input
5	HWB1+	Input	HW Pos B Chan.	Also direction input
6	HWB1-	Input	HW Neg B Chan.	Also direction input
7	HWA2+	Input	HW Pos A Chan.	Also pulse input
8	HWA2-	Input	HW Neg A Chan.	Also pulse input
9	HWB2+	Input	HW Pos B Chan.	Also direction input
10	HWB2-	Input	HW Neg B Chan.	Also direction input
11	PUL1+	Output	PFM Pos Pulse	Also PWM output
12	PUL1-	Output	PFM Neg Pulse	Also PWM output
13	DIR1+	Output	PFM Pos Dir. Out	Also PWM output
14	DIR1-	Output	PFM Neg Dir Out	Also PWM output
15	PUL2+	Output	PFM Pos Pulse	Also PWM output
16	PUL2-	Output	PFM Neg Pulse	Also PWM output
17	DIR2+	Output	PFM Pos Dir. Out	Also PWM output
18	DIR2-	Output	PFM Neg Dir Out	Also PWM output
19	GND	Common	Reference Voltage	
20	+5V	Output	Supply Voltage	To power external circuitry

J8 (JEQU) Position Compare Output Connector

Pin #	Symbol	Function	Description	Notes
1	EQU1/	Output	Enc. 1 Comp-Eq	Low is true
2	EQU2/	Output	Enc. 2 Comp-Eq	Low is true
3	EQU3/	Output	Enc. 3 Comp-Eq	Low is true
4	EQU4/	Output	Enc. 4 Comp-Eq	Low is true
5	EQU5/	Output	Enc. 5 Comp-Eq	Low is true
6	EQU6/	Output	Enc. 6 Comp-Eq	Low is true
7	EQU7/	Output	Enc. 7 Comp-Eq	Low is true
8	EQU8/	Output	Enc. 8 Comp-Eq	Low is true
9	+V	Supply	Positive Supply	+5V to +24V
10	GND	Common	Digital Ground	
This connector provides the position-compare outputs for the eight encoder channels.				

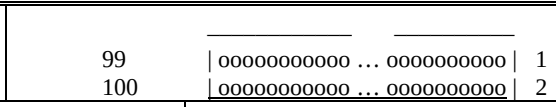
J9 (JMACH1) Machine Connector

J9 (JMACH1) Machine Connector



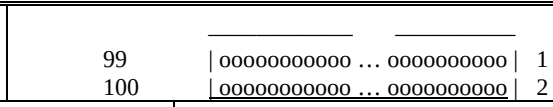
Pin #	Symbol	Function	Description	Notes
1	+5V	Output / Input	+5V Power	For external circuit or from external supply
2	+5V	Output / Input	+5V Power	"
3	GND	Common	Reference Voltage	
4	GND	Common	Reference Voltage	
5	CHA1+	Input	Enc 1 Positive A Chan.	Also pulse input
6	CHA1-	Input	Enc 1 Negative A Chan.	"
7	CHB1+	Input	Enc 1 Positive B Chan.	Also direction input
8	CHB1-	Input	Enc 1 Negative B Chan.	"
9	CHC1+	Input	Enc 1 Positive C Chan.	Index channel
10	CHC1-	Input	Enc 1 Negative C Chan.	"
11	CHU1	Input	Chan 1 U Flag	Hall effect, fault code, or sub-count
12	CHV1	Input	Chan 1 V Flag	Hall effect, fault code, or sub-count
13	CHW1	Input	Chan 1 W Flag	Hall effect, fault code, or sub-count
14	CHT1	Input	Chan 1 T Flag	Fault code, or sub-count
15	USER1	Input	General Purpose User Flag	Hardware capture flag, or sub-count
16	PLIM1	Input	Positive Overtravel Limit	Hardware capture flag
17	MLIM1	Input	Negative Overtravel Limit	Hardware capture flag
18	HOME1	Input	Home Switch Input	Hardware capture flag
19	ACCFLT1	Input	Accessory Fault Flag	For loss of acc supply voltage
20	WD0/	Output	Watchdog Output	Low is PMAC watchdog fault
21	SCLK12+	Input / Output	Encoder Sample Clock	Direction controlled by PMAC2 jumper
22	SCLK12-	Input / Output	Encoder Sample Clock	Direction controlled by PMAC2 jumper
23	ADC_CLK1+	Output	A/D Converter Clock	Programmable frequency
24	ADC_CLK1-	Output	A/D Converter Clock	Programmable frequency
25	ADC_STB1+	Output	A/D Converter Strobe	Programmable sequence
26	ADC_STB1-	Output	A/D Converter Strobe	Programmable sequence
27	ADC_DAA1+	Input	Chan A ADC Serial Data	MSB first
28	ADC_DAA1-	Input	Chan A ADC Serial Data	MSB first
29	ADC_DAB1+	Input	Chan B ADC Serial Data	MSB first
30	ADC_DAB1-	Input	Chan B ADC Serial Data	MSB first

J9 (JMACH1) Machine Connector (Continued)



Pin #	Symbol	Function	Description	Notes
31	AENA1+	Output	Amplifier Enable	High is enable
32	AENA1-	Output	Amplifier Enable	Low is enable
33	FAULT1+	Input	Amplifier Fault	Programmable polarity
34	FAULT1-	Input	Amplifier Fault	Programmable polarity
35	PWMATOP1+ DAC_CLK1+	Output	Phase A Top CMD or DAC Clock	Programmable function control
36	PWMATOP1- DAC_CLK1-	Output	Phase A Top CMD or DAC Clock	Programmable function control
37	PWMABOT1+ DAC1A+	Output	Phase A Bottom CMD or DAC A Serial Data	Programmable function control
38	PWMABOT1- DAC1A-	Output	Phase A Bottom CMD or DAC A Serial Data	Programmable function control
39	PWMBTOP1+ DAC_STB1+	Output	Phase B Top CMD or DAC Strobe	Programmable function control
40	PWMBTOP1- DAC_STB1-	Output	Phase B Top CMD or DAC Strobe	Programmable function control
41	PWMBBOT1+ DAC1B+	Output	Phase B Bottom CMD or DAC B Serial Data	Programmable function control
42	PWMBBOT1- DAC1B-	Output	Phase B Bottom CMD or DAC B Serial Data	Programmable function control
43	PWMCTOP1+ DIR1+	Output	Phase B Top CMD or PFM Direction	Programmable function control
44	PWMCTOP1- DIR1-	Output	Phase B Top CMD or PFM Direction	Programmable function control
45	PWMCBOT1+ PULSE1+	Output	Phase B Bottom CMD or PFM Pulse	Programmable function control
46	PWMCBOT1- PULSE1-	Output	Phase B Bottom CMD or PFM Pulse	Programmable function control
47	GND	Common	Reference Voltage	
48	GND	Common	Reference Voltage	
49	+5V	Output / Input	+5v Power	For external circuit or from external supply
50	+5V	Output / Input	+5v Power	For external circuit or from external supply
51	+5V	Output / Input	+5v Power	For external circuit or from external supply
52	+5V	Output / Input	+5v Power	For external circuit or from external supply
53	GND	Common	Reference Voltage	
54	GND	Common	Reference Voltage	
55	CHA2+	Input	Enc 2 Positive A Chan.	Also pulse input
56	CHA2-	Input	Enc 2 Negative A Chan.	Also pulse input
57	CHB2+	Input	Enc 2 Positive B Chan.	Also direction input
58	CHB2-	Input	Enc 2 Negative B Chan.	Also direction input
59	CHC2+	Input	Enc 2 Positive C Chan.	Index channel
60	CHC2-	Input	Enc 2 Negative C Chan.	Index channel
61	CHU2	Input	Chan 2 U Flag	Hall effect, fault code, or sub-count
62	CHV2	Input	Chan 2 V Flag	Hall effect, fault code, or sub-count

J9 (JMACH1) Machine Connector (Continued)



Pin #	Symbol	Function	Description	Notes
63	CHW2	Input	Chan 2 W Flag	Hall effect, fault code, or sub-count
64	CHT2	Input	Chan 2 T Flag	Fault code, or sub-count
65	USER2	Input	General Purpose User Flag	Hardware capture flag, or sub-count
66	PLIM2	Input	Positive Overtravel Limit	Hardware capture flag
67	MLIM2	Input	Negative Overtravel Limit	Hardware capture flag
68	HOME2	Input	Home Switch Input	Hardware capture flag
69	ACCFLT2	Input	Accessory Fault Flag	For loss of ACC supply voltage
70	WD0/	Output	Watchdog Output	Low is PMAC watchdog fault
71	SCLK12+	Input / Output	Encoder Sample Clock	Direction controlled by PMAC2 jumper
72	SCLK12-	Input / Output	Encoder Sample Clock	Direction controlled by PMAC2 jumper
73	ADC_CLK2+	Output	A/D Converter Clock	Programmable frequency
74	ADC_CLK2-	Output	A/D Converter Clock	Programmable frequency
75	ADC_STB2+	Output	A/D Converter Strobe	Programmable sequence
76	ADC_STB2-	Output	A/D Converter Strobe	Programmable sequence
77	ADC_DAA2+	Input	Chan A ADC Serial Data	MSB first
78	ADC_DAA2-	Input	Chan A ADC Serial Data	MSB first
79	ADC_DAB2+	Input	Chan B ADC Serial Data	MSB first
80	ADC_DAB2-	Input	Chan B ADC Serial Data	MSB first
81	AENA2+	Output	Amplifier Enable	High is enable
82	AENA2-	Output	Amplifier Enable	Low is enable
83	FAULT2+	Input	Amplifier Fault	Programmable polarity
84	FAULT2-	Input	Amplifier Fault	Programmable polarity
85	PWMATOP2+ DAC_CLK2+	Output	Phase A Top CMD or DAC Clock	Programmable function control
86	PWMATOP2- DAC_CLK2-	Output	Phase A Top CMD or DAC Clock	Programmable function control
87	PWMABOT2+ DAC2A+	Output	Phase A Bottom CMD or DAC A Serial Data	Programmable function control
88	PWMABOT2- DAC2A-	Output	Phase A Bottom CMD or DAC A Serial Data	Programmable function control
89	PWMBTOP2+ DAC_STB2+	Output	Phase B Top CMD or DAC Strobe	Programmable function control
90	PWMBTOP2- DAC_STB2-	Output	Phase B Top CMD or DAC Strobe	Programmable function control
91	PWMBBOT2+ DAC2B+	Output	Phase B Bottom CMD or DAC B Serial Data	Programmable function control
92	PWMBBOT2- DAC2B-	Output	Phase B Bottom CMD or DAC B Serial Data	Programmable function control
93	PWMCTOP2+ DIR2+	Output	Phase B Top CMD or PFM Direction	Programmable function control
94	PWMCTOP2- DIR2-	Output	Phase B Top CMD or PFM Direction	Programmable function control
95	PWMCBOT2+ PULSE2+	Output	Phase B Bottom CMD or PFM Pulse	Programmable function control
96	PWMCBOT2- PULSE2-	Output	Phase B Bottom CMD or PFM Pulse	Programmable function control

J9 (JMACH1) Machine Connector (Continued)

```
                                  ___________   ___________
99                               | oooooooooo … oooooooooo |  1
100                              | oooooooooo … oooooooooo |  2
```

Pin #	Symbol	Function	Description	Notes
97	GND	Common	Reference Voltage	
98	GND	Common	Reference Voltage	
99	+5V	Output / Input	+5V Power	For external circuit or from external supply
100	+5V	Output / Input	+5V Power	For external circuit or from external supply

The JMACH1 connector provides the interface pins for channels 1 and 2. Usually, it is connected to a breakout board, such as one of the Acc-8x family of boards, or an application-specific interface board.
Connector: 100-pin male box header with center key, 0050" pitch. AMP part # 1-04068-7 Delta Tau part # 014-00010-FPB.

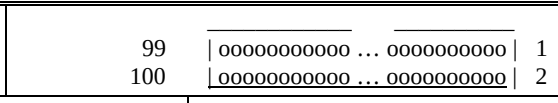
J10 (JMACH2) Machine Connector

J10 (JMACH2) Machine Connector

```
                                  ___________   ___________
99                               | oooooooooo … oooooooooo |  1
100                              | oooooooooo … oooooooooo |  2
```

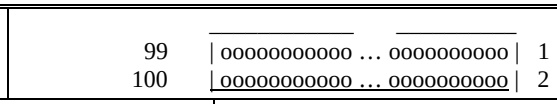
Pin #	Symbol	Function	Description	Notes
1	+5V	Output / Input	+5V Power	For external circuit or from external supply
2	+5V	Output / Input	+5V Power	For external circuit or from external supply
3	GND	Common	Reference Voltage	
4	GND	Common	Reference Voltage	
5	CHA3+	Input	Enc 3 Positive A Chan.	Also pulse input
6	CHA3-	Input	Enc 3 Negative A Chan.	Also pulse input
7	CHB3+	Input	Enc 3 Positive B Chan.	Also direction input
8	CHB3-	Input	Enc 3 Negative B Chan.	Also direction input
9	CHC3+	Input	Enc 3 Positive C Chan.	Index channel
10	CHC3-	Input	Enc 3 Negative C Chan.	Index channel
11	CHU3	Input	Chan 3 U Flag	Hall effect, fault code, or sub-count
12	CHV3	Input	Chan 3 V Flag	Hall effect, fault code, or sub-count
13	CHW3	Input	Chan 3 W Flag	Hall effect, fault code, or sub-count
14	CHT3	Input	Chan 3 T Flag	Fault code, or sub-count
15	USER3	Input	General Purpose User Flag	Hardware capture flag, or sub-count
16	PLIM3	Input	Positive Overtravel Limit	Hardware capture flag
17	MLIM3	Input	Negative Overtravel Limit	Hardware capture flag
18	HOME3	Input	Home Switch Input	Hardware capture flag
19	ACCFLT3	Input	Accessory Fault Flag	For loss of acc supply voltage
20	WD0/	Output	Watchdog Output	Low is PMAC watchdog fault
21	SCLK34+	Input / Output	Encoder Sample Clock	Direction controlled by PMAC2 jumper
22	SCLK34-	Input / Output	Encoder Sample Clock	Direction controlled by PMAC2 jumper
23	ADC_CLK3+	Output	A/D Converter Clock	Programmable frequency
24	ADC_CLK3-	Output	A/D Converter Clock	Programmable frequency
25	ADC_STB3+	Output	A/D Converter Strobe	Programmable sequence
26	ADC_STB3-	Output	A/D Converter Strobe	Programmable sequence
27	ADC_DAA3+	Input	Chan A ADC Serial Data	MSB first

J10 (JMACH2) Machine Connector (Continued)



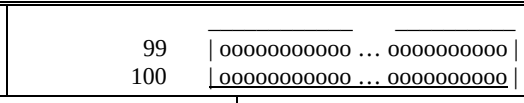
Pin #	Symbol	Function	Description	Notes
28	ADC_DAA3-	Input	Chan A ADC Serial Data	MSB first
29	ADC_DAB3+	Input	Chan B ADC Serial Data	MSB first
30	ADC_DAB3-	Input	Chan B ADC Serial Data	MSB first
31	AENA3+	Output	Amplifier Enable	High is enable
32	AENA3-	Output	Amplifier Enable	Low is enable
33	FAULT3+	Input	Amplifier Fault	Programmable polarity
34	FAULT3-	Input	Amplifier Fault	Programmable polarity
35	PWMATOP3+ DAC_CLK3+	Output	Phase A Top CMD or DAC Clock	Programmable function control
36	PWMATOP3- DAC_CLK3-	Output	Phase A Top CMD or DAC Clock	Programmable function control
37	PWMABOT3+ DAC3A+	Output	Phase A Bottom CMD or DAC A Serial Data	Programmable function control
38	PWMABOT3- DAC3A-	Output	Phase A Bottom CMD or DAC A Serial Data	Programmable function control
39	PWMBTOP3+ DAC_STB3+	Output	Phase B Top CMD or DAC Strobe	Programmable function control
40	PWMBTOP3- DAC_STB3-	Output	Phase B Top CMD or DAC Strobe	Programmable function control
41	PWMBBOT3+ DAC3B+	Output	Phase B Bottom CMD or DAC B Serial Data	Programmable function control
42	PWMBBOT3- DAC3B-	Output	Phase B Bottom CMD or DAC B Serial Data	Programmable function control
43	PWMCTOP3+ DIR3+	Output	Phase B Top CMD or PFM Direction	Programmable function control
44	PWMCTOP3- DIR3-	Output	Phase B Top CMD or PFM Direction	Programmable function control
45	PWMCBOT3+ PULSE3+	Output	Phase B Bottom CMD or PFM Pulse	Programmable function control
46	PWMCBOT3- PULSE3-	Output	Phase B Bottom CMD or PFM Pulse	Programmable function control
47	GND	Common	Reference Voltage	
48	GND	Common	Reference Voltage	
49	+5V	Output / Input	+5V Power	For external circuit or from external supply
50	+5V	Output / Input	+5V Power	For external circuit or from external supply
51	+5V	Output / Input	+5V Power	For external circuit or from external supply
52	+5V	Output / Input	+5V Power	For external circuit or from external supply
53	GND	Common	Reference Voltage	
54	GND	Common	Reference Voltage	
55	CHA4+	Input	Enc 4 Positive A Chan.	Also pulse input
56	CHA4-	Input	Enc 4 Negative A Chan.	Also pulse input
57	CHB4+	Input	Enc 4 Positive B Chan.	Also direction input
58	CHB4-	Input	Enc 4 Negative B Chan.	Also direction input
59	CHC4+	Input	Enc 4 Positive C Chan.	Index channel

J10 (JMACH2) Machine Connector (Continued)



Pin #	Symbol	Function	Description	Notes
60	CHC4-	Input	Enc 4 Negative C Chan.	Index channel
61	CHU4	Input	Chan 4 U Flag	Hall effect, fault code, or sub-count
62	CHV4	Input	Chan 4 V Flag	Hall effect, fault code, or sub-count
63	CHW4	Input	Chan 4 W Flag	Hall effect, fault code, or sub-count
64	CHT4	Input	Chan 4 T Flag	Fault code, or sub-count
65	USER4	Input	General Purpose User Flag	Hardware capture flag, or sub-count
66	PLIM4	Input	Positive Overtravel Limit	Hardware capture flag
67	MLIM4	Input	Negative Overtravel Limit	Hardware capture flag
68	HOME4	Input	Home Switch Input	Hardware capture flag
69	ACCFLT4	Input	Accessory Fault Flag	For loss of acc supply voltage
70	WD0/	Output	Watchdog Output	Low is PMAC watchdog fault
71	SCLK34+	Input / Output	Encoder Sample Clock	Direction controlled by PMAC2 jumper
72	SCLK34-	Input / Output	Encoder Sample Clock	Direction controlled by PMAC2 jumper
73	ADC_CLK4+	Output	A/D Converter Clock	Programmable frequency
74	ADC_CLK4-	Output	A/D Converter Clock	Programmable frequency
75	ADC_STB4+	Output	A/D Converter Strobe	Programmable sequence
76	ADC_STB4-	Output	A/D Converter Strobe	Programmable sequence
77	ADC_DAA4+	Input	Chan A ADC Serial Data	MSB first
78	ADC_DAA4-	Input	Chan A ADC Serial Data	MSB first
79	ADC_DAB4+	Input	Chan B ADC Serial Data	MSB first
80	ADC_DAB4-	Input	Chan B ADC Serial Data	MSB first
81	AENA4+	Output	Amplifier Enable	High is enable
82	AENA4-	Output	Amplifier Enable	Low is enable
83	FAULT4+	Input	Amplifier Fault	Programmable polarity
84	FAULT4-	Input	Amplifier Fault	Programmable polarity
85	PWMATOP4+ DAC_CLK4+	Output	Phase A Top CMD or DAC Clock	Programmable function control
86	PWMATOP4- DAC_CLK4-	Output	Phase A Top CMD or DAC Clock	Programmable function control
87	PWMABOT4+ DAC4A+	Output	Phase A Bottom CMD or DAC A Serial Data	Programmable function control
88	PWMABOT4- DAC4A-	Output	Phase A Bottom CMD or DAC A Serial Data	Programmable function control
89	PWMBTOP4+ DAC_STB4+	Output	Phase B Top CMD or DAC Strobe	Programmable function control
90	PWMBTOP4- DAC_STB4-	Output	Phase B Top CMD or DAC Strobe	Programmable function control
91	PWMBBOT4+ DAC4B+	Output	Phase B Bottom CMD or DAC B Serial Data	Programmable function control
92	PWMBBOT4- DAC4B-	Output	Phase B Bottom CMD or DAC B Serial Data	Programmable function control
93	PWMCTOP4+ DIR4+	Output	Phase B Top CMD or PFM Direction	Programmable function control
94	PWMCTOP4- DIR4-	Output	Phase B Top CMD or PFM Direction	Programmable function control

J10 (JMACH2) Machine Connector (Continued)



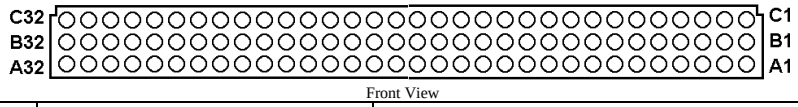
Pin #	Symbol	Function	Description	Notes
95	PWMCBOT4+ PULSE4+	Output	Phase B Bottom CMD or PFM Pulse	Programmable function control
96	PWMCBOT4- PULSE4-	Output	Phase B Bottom CMD or PFM Pulse	Programmable function control
97	GND	Common	Reference Voltage	
98	GND	Common	Reference Voltage	
99	+5V	Output / Input	+5V Power	For external circuit or from external supply
100	+5V	Output / Input	+5V Power	For external circuit or from external supply

The JMACH2 connector provides the interface pins for channels 3 and 4. Usually, it is connected to a breakout board, such as one of the Acc-8x family of boards, or an application-specific interface board.

Connector: 100-pin male box header with center key, 0050" pitch. AMP part # 1-04068-7 Delta Tau part # 014-00010-FPB.

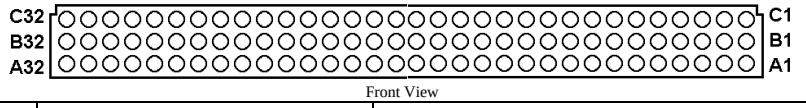
P1 (JVME) VME Bus Connector

P1 JVME (96-Pin Header)



Pin #	Row A	Row B	Row C
01	D00	BBSY/	D08
02	D01	BCLR/	D09
03	D02	ACFAIL/	D10
04	D03	B0IN/	D11
05	D04	BG0OUT/	D12
06	D05	BG1IN/	D13
07	D06	BG1OUT/	D14
08	D07	BG2IN/	D15
09	GND	BG2OUT/	GND
10	SYSCLK	BG3IN/	SYSFAIL/
11	GND	BG3OUT/	BERR/
12	DS1/	BR0/	SYSRESET/
13	DS0/	BR1/	LWORD/
14	WRITE/	BR2/	AM5
15	GND	BR3/	A23
16	DTACK/	AM0	A22
17	GND	AM1	A21
18	AS/	AM2	A20
19	GND	AM3	A19
20	IACK/	GND	A18
21	IACKIN/	SERCLK	A17
22	IACKOUT/	SERDAT/	A16
23	AM4	GND	A15
24	A07	IRQ7/	A14
25	A06	IRQ6/	A13
26	A05	IRQ5/	A12
27	A04	IRQ4/	A11

P1 JVME (96-Pin Header) Continued



Pin #	Row A	Row B	Row C
28	A03	IRQ3/	A10
29	A02	IRQ2/	A09
30	A01	IRQ1/	A08
31	-12V	+5V STDBY	+12V
32	+5V	+5V	+5V

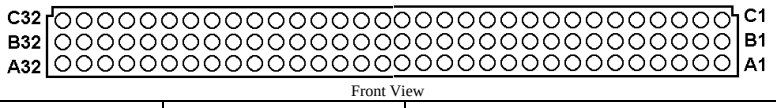
This is the standard VME connector. It is sufficient for 16-bit or 24-bit addressing, and for 8-bit or 16-bit data. For 32-bit addressing the B-row of P2 must be used as well. PMAC does not support 32-bit data transfers over the bus, even with the B-row of P2.

If P1 is connected to the VME backplane, PMAC is connected to the +5V supply and GND automatically. In this case, no other +5V supply should be connected.

P2 (JMACHA) Alternate Machine Connector

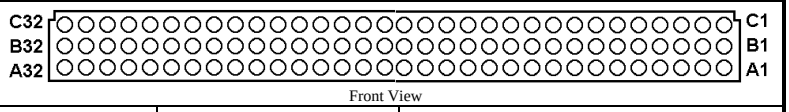
The P2 connector provides an alternate path to J9 and J10 for the machine interface connections for Channels 1-4. Only the positive signals of complementary pairs are brought out on this connector. For the inputs, the complementary lines are tied to 2.5V on PMAC2. Refer to the J9 and J10 pin descriptions for more detailed information on each pin.

P2/JMACHA (96-Pin Header) Continued



Pin#	Row A	Row B (Format A)	Row B (Format B)	Row C
01	+5V	+5V	CHU1	+5V
02	GND	GND	CHU3	GND
03	CHA1	(Reserved)	CHV1	CHA3
04	CHB1	VA24	CHV3	CHB3
05	CHC1	VA25	CHW1	CHC3
06	PLIM1	VA26	CHW3	PLIM3
07	MLIM1	VA27	CHT1	MLIM3
08	HOME1	VA28	CHT3	HOME3
09	AENA1	VA29	USER1	AENA3
10	FAULT1	VA30	USER3	FAULT3
11	PWMATOP1/ DAC_CLK1	VA31	ADC_DAA1	PWMATOP3/ DAC_CLK3
12	PWMABOT1/ DAC1A	GND	ADC_DAA3	PWMABOT3/ DAC3A
13	PWMBTOP1/ DAC_STB1	+5V	ADC_DAB1	PWMBTOP3/ DAC_STB3
14	PWMBBOT1/ DAC1B	VD16*	ADC_DAB3	PWMBBOT3/ DAC3B
15	PWMCTOP1/ DIR1	VD17*	ADC_CLK1234	PWMCTOP3/ DIR3
16	PWMCBOT1/ PULSE1	VD18*	ADC_STB1234	PWMCBOT3/ PULSE3
17	CHA2	VD19*	SCLK1234	CHA4
18	CHB2	VD20*	WD0/	CHB4
19	CHC2	VD21*	CHU2	CHC4
20	PLIM2	VD22*	CHU4	PLIM4
21	MLIM2	VD23*	CHV2	MLIM4
22	HOME2	GND	CHV4	HOME4
23	AENA2	VD24*	CHW2	AENA4
24	FAULT2	VD25*	CHW4	FAULT4
25	PWMATOP2/ DAC_CLK2	VD26*	CHT2	PWMATOP4/ DAC_CLK4

P2/JMACHA (96-Pin Header) Continued



Pin#	Row A	Row B (Format A)	Row B (Format B)	Row C
26	PWMABOT2/ DAC2A	VD27*	CHT4	PWMABOT4/ DAC4A
27	PWMBTOP2/ DAC_STB2	VD28*	USER2	PWMBTOP4/ DAC_STB4
28	PWMBBOT2/ DAC2B	VD29*	USER4	PWMBBOT4/ DAC4B
29	PWMCTOP2/ DIR2	VD30*	ADC_DAA2	PWMCTOP4/ DIR4
30	PWMCBOT2/ PULSE2	VD31*	ADC_DAA4	PWMCBOT4/ PULSE4
31	GND	GND	ADC_DAB2	GND
32	+5V	+5V	ADC_DAB4	+5V

Note: Format A for the B-row will be used if E7A-H, E8A-H, E9A-H, and E10A-H connect pins 2 and 3. This format must be used for a 32-bit VME system. Format B for the B-row will be used if these jumpers connect pins 1 and 2. This format is not compatible with 32-bit VME systems.

* Not used

TB1 (2/4-Pin Terminal Block)

This terminal block can be used to provide the input for the power supply for the circuits on the PMAC2 board when it is not in a bus configuration. When the PMAC2 is in a bus configuration, these supplies automatically come through the bus connector from the bus power supply; in this case, this terminal block should not be used.

Pin#	Symbol	Function	Description	Notes
1	GND	Common	Reference Voltage	
2	+5V	Input	Positive Supply Voltage	Supplies all PMAC digital circuits
3	+12V	Input	Positive Supply Voltage	+12V to +15V; not required on-board; used on j1 to supply analog inputs
4	-12V	Input	Negative Supply Voltage	-12V to –15V; required for opt-12 ADCs; used on J1 to supply analog inputs

Note: Unless Option 12 (Analog-to-Digital Converters) is included on the board, only pins 1 and 2 may be provided on this terminal block.

TB2 (4-Pin Terminal Block)

This terminal block provides the output for PMAC2's watchdog timer relay, both normally open and normally closed contacts.

Pin#	Symbol	Function	Description	Notes
1	WD_NC	Output	Watchdog Relay Out	Normally closed
2	COM	Input	Watchdog Return	+V or 0V
3	WD_NO	Output	Watchdog Relay Out	Normally open
4	COM	Input	Watchdog Return	+V or 0V

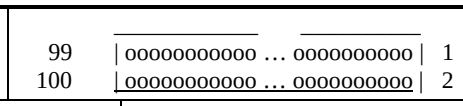
Note: The normally closed relay contact is open while PMAC2 is operating properly – it has power and the watchdog timer is not tripped – and closed when the PMAC2 is not operating properly – either it has lost power or the watchdog timer has tripped. The normally open relay contact is closed while PMAC2 is operating properly and open when PMAC2 is not operating properly.

AXIS PIGGYBACK BOARD CONNECTOR DESCRIPTIONS

J11 (JMACH3) Machine Connector

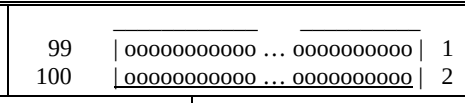
(Only present if Option 1V ordered)

J11 (JMACH3) Machine Connector



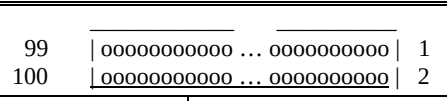
Pin#	Symbol	Function	Description	Notes
1	+5V	Output / Input	+5V Power	For external circuit or from external supply
2	+5V	Output / Input	+5V Power	For external circuit or from external supply
3	GND	Common	Reference Voltage	
4	GND	Common	Reference Voltage	
5	CHA5+	Input	Enc 5 Pos. A Chan.	Also pulse input
6	CHA5-	Input	Enc 5 Neg. A Chan.	Also pulse input
7	CHB5+	Input	Enc 5 Pos. B Chan.	Also direction input
8	CHB5-	Input	Enc 5 Neg. B Chan.	Also direction input
9	CHC5+	Input	Enc 5 Pos. C Chan.	Index channel
10	CHC5-	Input	Enc 5 Neg. C Chan.	Index channel
11	CHU5	Input	Chan 5 U Flag	Hall effect, fault code, or sub-count
12	CHV5	Input	Chan 5 V Flag	Hall effect, fault code, or sub-count
13	CHW5	Input	Chan 5 W Flag	Hall effect, fault code, or sub-count
14	CHT5	Input	Chan 5 T Flag	Fault code, or sub-count
15	USER5	Input	General Purpose User Flag	Hardware capture flag, or sub-count
16	PLIM5	Input	Positive Overtravel Limit	Hardware capture flag
17	MLIM5	Input	Negative Overtravel Limit	Hardware capture flag
18	HOME5	Input	Home Switch Input	Hardware capture flag
19	ACCFLT5	Input	Accessory Fault Flag	For loss of ACC supply voltage
20	WD0/	Output	Watchdog Output	Low is PMAC watchdog fault
21	SCLK56+	Input / Output	Encoder Sample Clock	Direction controlled by PMAC2 jumper
22	SCLK56-	Input / Output	Encoder Sample Clock	Direction controlled by PMAC2 jumper
23	ADC_CLK5+	Output	A/D Converter Clock	Programmable frequency
24	ADC_CLK5-	Output	A/D Converter Clock	Programmable frequency
25	ADC_STB5+	Output	A/D Converter Strobe	Programmable sequence
26	ADC_STB5-	Output	A/D Converter Strobe	Programmable sequence
27	ADC_DAA5+	Input	Chan A ADC Serial Data	MSB first
28	ADC_DAA5-	Input	Chan A ADC Serial Data	MSB first
29	ADC_DAB5+	Input	Chan B ADC Serial Data	MSB first
30	ADC_DAB5-	Input	Chan B ADC Serial Data	MSB first
31	AENA5+	Output	Amplifier Enable	High is enable
32	AENA5-	Output	Amplifier Enable	Low is enable
33	FAULT5+	Input	Amplifier Fault	Programmable polarity
34	FAULT5-	Input	Amplifier Fault	Programmable polarity
35	PWMATOP5+ DAC_CLK5+	Output	Phase A Top CMD or DAC Clock	Programmable function control
36	PWMATOP5- DAC_CLK5-	Output	Phase A Top CMD or DAC Clock	Programmable function control
37	PWMABOT5+ DAC5A+	Output	Phase A Bottom CMD or DAC A Serial Data	Programmable function control

J11 (JMACH3) Machine Connector (Continued)



Pin#	Symbol	Function	Description	Notes
38	PWMABOT5- DAC5A-	Output	Phase A Bottom CMD or DAC A Serial Data	Programmable function control
39	PWMBTOP5+ DAC_STB5+	Output	Phase B Top CMD or DAC Strobe	Programmable function control
40	PWMBTOP5- DAC_STB5-	Output	Phase B Top CMD or DAC Strobe	Programmable function control
41	PWMBBOT5+ DAC5B+	Output	Phase B Bottom CMD or DAC B Serial Data	Programmable function control
42	PWMBBOT5- DAC5B-	Output	Phase B Bottom CMD or DAC B Serial Data	Programmable function control
43	PWMCTOP5+ DIR5+	Output	Phase B Top CMD or PFM Direction	Programmable function control
44	PWMCTOP5- DIR5-	Output	Phase B Top CMD or PFM Direction	Programmable function control
45	PWMCBOT5+ PULSE5+	Output	Phase B Bottom CMD or PFM Pulse	Programmable function control
46	PWMCBOT5- PULSE5-	Output	Phase B Bottom CMD or PFM Pulse	Programmable function control
47	GND	Common	Reference Voltage	
48	GND	Common	Reference Voltage	
49	+5V	Output / Input	+5v Power	For external circuit or from external supply
50	+5V	Output / Input	+5v Power	For external circuit or from external supply
51	+5V	Output / Input	+5v Power	For external circuit or from external supply
52	+5V	Output / Input	+5v Power	For external circuit or from external supply
53	GND	Common	Reference Voltage	
54	GND	Common	Reference Voltage	
55	CHA6+	Input	Enc 6 Positive A Chan.	Also pulse input
56	CHA6-	Input	Enc 6 Negative A Chan.	Also pulse input
57	CHB6+	Input	Enc 6 Positive B Chan.	Also direction input
58	CHB6-	Input	Enc 6 Negative B Chan.	Also direction input
59	CHC6+	Input	Enc 6 Positive C Chan.	Index channel
60	CHC6-	Input	Enc 6 Negative C Chan.	Index channel
61	CHU6	Input	Chan 6 U Flag	Hall effect, fault code, or sub-count
62	CHV6	Input	Chan 6 V Flag	Hall effect, fault code, or sub-count
63	CHW6	Input	Chan 6 W Flag	Hall effect, fault code, or sub-count
64	CHT6	Input	Chan 6 T Flag	Fault code, or sub-count
65	USER6	Input	General Purpose User Flag	Hardware capture flag, or sub-count
66	PLIM6	Input	Positive Overtravel Limit	Hardware capture flag
67	MLIM6	Input	Negative Overtravel Limit	Hardware capture flag
68	HOME6	Input	Home Switch Input	Hardware capture flag
69	ACCFLT6	Input	Accessory Fault Flag	For loss of acc supply voltage
70	WD0/	Output	Watchdog Output	Low is PMAC watchdog fault

J11 (JMACH3) Machine Connector (Continued)



Pin#	Symbol	Function	Description	Notes
71	SCLK56+	Input / Output	Encoder Sample Clock	Direction controlled by PMAC2 jumper
72	SCLK56-	Input / Output	Encoder Sample Clock	Direction controlled by PMAC2 jumper
73	ADC_CLK6+	Output	A/D Converter Clock	Programmable frequency
74	ADC_CLK6-	Output	A/D Converter Clock	Programmable frequency
75	ADC_STB6+	Output	A/D Converter Strobe	Programmable sequence
76	ADC_STB6-	Output	A/D Converter Strobe	Programmable sequence
77	ADC_DAA6+	Input	Chan A ADC Serial Data	MSB first
78	ADC_DAA6-	Input	Chan A ADC Serial Data	MSB first
79	ADC_DAB6+	Input	Chan B ADC Serial Data	MSB first
80	ADC_DAB6-	Input	Chan B ADC Serial Data	MSB first
81	AENA6+	Output	Amplifier Enable	High is enable
82	AENA6-	Output	Amplifier Enable	Low is enable
83	FAULT6+	Input	Amplifier Fault	Programmable polarity
84	FAULT6-	Input	Amplifier Fault	Programmable polarity
85	PWMATOP6+ DAC_CLK6+	Output	Phase A Top CMD or DAC Clock	Programmable function control
86	PWMATOP6- DAC_CLK6-	Output	Phase A Top CMD or DAC Clock	Programmable function control
87	PWMABOT6+ DAC6A+	Output	Phase A Bottom CMD or DAC A Serial Data	Programmable function control
88	PWMABOT6- DAC6A-	Output	Phase A Bottom CMD or DAC A Serial Data	Programmable function control
89	PWMBTOP6+ DAC_STB6+	Output	Phase B Top CMD or DAC Strobe	Programmable function control
90	PWMBTOP6- DAC_STB6-	Output	Phase B Top CMD or DAC Strobe	Programmable function control
91	PWMBBOT6+ DAC6B+	Output	Phase B Bottom CMD or DAC B Serial Data	Programmable function control
92	PWMBBOT6- DAC6B-	Output	Phase B Bottom CMD or DAC B Serial Data	Programmable function control
93	PWMCTOP6+ DIR6+	Output	Phase B Top CMD or PFM Direction	Programmable function control
94	PWMCTOP6- DIR6-	Output	Phase B Top CMD or PFM Direction	Programmable function control
95	PWMCBOT6+ PULSE6+	Output	Phase B CMD or PFM Pulse	Programmable function control
96	PWMCBOT6- PULSE6-	Output	Phase B Bottom CMD or PFM Pulse	Programmable function control
97	GND	Common	Reference Voltage	
98	GND	Common	Reference Voltage	
99	+5V	Output / Input	+5V Power	For external circuit or from external supply
100	+5V	Output / Input	+5V Power	For external circuit or from external supply

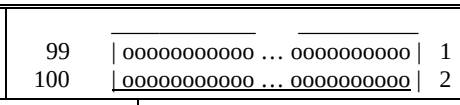
The JMACH3 connector provides the interface pins for channels 5 and 6. It is usually connected to a breakout board, such as one of the Acc-8x family of boards, or an application-specific interface board.

Connector: 100-pin male box header with center key, 0050" pitch. AMP part # 1-04068-7 Delta Tau part # 014-00010-FPB.

J12 (JMACH4) Machine Connector

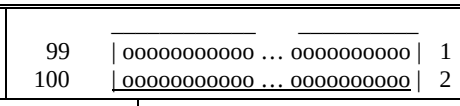
(Only present if Option 1 ordered)

J12 (JMACH4) Machine Connector



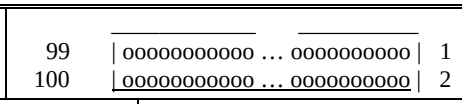
Pin#	Symbol	Function	Description	Notes
1	+5V	Output / Input	+5V Power	For external circuit or from external supply
2	+5V	Output / Input	+5V Power	For external circuit or from external supply
3	GND	Common	Reference Voltage	
4	GND	Common	Reference Voltage	
5	CHA7+	Input	Enc 7 Positive A Chan.	Also pulse input
6	CHA7-	Input	Enc 7 Negative A Chan.	Also pulse input
7	CHB7+	Input	Enc 7 Positive B Chan.	Also direction input
8	CHB7-	Input	Enc 7 Negative B Chan.	Also direction input
9	CHC7+	Input	Enc 7 Positive C Chan.	Index channel
10	CHC7-	Input	Enc 7 Negative C Chan.	Index channel
11	CHU7	Input	Chan 7 U Flag	Hall effect, fault code, or sub-count
12	CHV7	Input	Chan 7 V Flag	Hall effect, fault code, or sub-count
13	CHW7	Input	Chan 7 W Flag	Hall effect, fault code, or sub-count
14	CHT7	Input	Chan 7 T Flag	Fault code, or sub-count
15	USER7	Input	General Purpose User Flag	Hardware capture flag, or sub-count
16	PLIM7	Input	Positive Overtravel Limit	Hardware capture flag
17	MLIM7	Input	Negative Overtravel Limit	Hardware capture flag
18	HOME7	Input	Home Switch Input	Hardware capture flag
19	ACCFLT7	Input	Accessory Fault Flag	For loss of acc supply voltage
20	WD0/	Output	Watchdog Output	Low is PMAC watchdog fault
21	SCLK78+	Input / Output	Encoder Sample Clock	Direction controlled by PMAC2 jumper
22	SCLK78-	Input / Output	Encoder Sample Clock	Direction controlled by PMAC2 jumper
23	ADC_CLK7+	Output	A/D Converter Clock	Programmable frequency
24	ADC_CLK7-	Output	A/D Converter Clock	Programmable frequency
25	ADC_STB7+	Output	A/D Converter Strobe	Programmable sequence
26	ADC_STB7-	Output	A/D Converter Strobe	Programmable sequence
27	ADC_DAA7+	Input	Chan A ADC Serial Data	MSB first
28	ADC_DAA7-	Input	Chan A ADC Serial Data	MSB first
29	ADC_DAB7+	Input	Chan B ADC Serial Data	MSB first
30	ADC_DAB7-	Input	Chan B ADC Serial Data	MSB first
31	AENA7+	Output	Amplifier Enable	High is enable
32	AENA7-	Output	Amplifier Enable	Low is enable
33	FAULT7+	Input	Amplifier Fault	Programmable polarity
34	FAULT7-	Input	Amplifier Fault	Programmable polarity
35	PWMATOP7+ DAC_CLK7+	Output	Phase A Top CMD or DAC Clock	Programmable function control
36	PWMATOP7- DAC_CLK7-	Output	Phase A Top CMD or DAC Clock	Programmable function control
37	PWMABOT7+ DAC7A+	Output	Phase A Bottom CMD or DAC A Serial Data	Programmable function control
38	PWMABOT7- DAC7A-	Output	Phase A Bottom CMD or DAC A Serial Data	Programmable function control

J12 (JMACH4) Machine Connector (Continued)



Pin#	Symbol	Function	Description	Notes
39	PWMBTOP7+ DAC_STB7+	Output	Phase B Top CMD or DAC Strobe	Programmable function control
40	PWMBTOP3- DAC_STB7-	Output	Phase B Top CMD or DAC Strobe	Programmable function control
41	PWMBBOT7+ DAC7B+	Output	Phase B Bottom CMD or DAC B Serial Data	Programmable function control
42	PWMBBOT7- DAC7B-	Output	Phase B Bottom CMD or DAC B Serial Data	Programmable function control
43	PWMCTOP7+ DIR7+	Output	Phase B Top CMD or PFM Direction	Programmable function control
44	PWMCTOP7- DIR7-	Output	Phase B Top CMD or PFM Direction	Programmable function control
45	PWMCBOT7+ PULSE7+	Output	Phase B Bottom CMD or PFM Pulse	Programmable function control
46	PWMCBOT7- PULSE7-	Output	Phase B Bottom CMD or PFM Pulse	Programmable function control
47	GND	Common	Reference Voltage	
48	GND	Common	Reference Voltage	
49	+5V	Output / Input	+5V Power	For external circuit or from external supply
50	+5V	Output / Input	+5V Power	For external circuit or from external supply
51	+5V	Output / Input	+5V Power	For external circuit or from external supply
52	+5V	Output / Input	+5V Power	For external circuit or from external supply
53	GND	Common	Reference Voltage	
54	GND	Common	Reference Voltage	
55	CHA8+	Input	Enc 8 Positive A Chan.	Also pulse input
56	CHA8-	Input	Enc 8 Negative A Chan.	Also pulse input
57	CHB8+	Input	Enc 8 Positive B Chan.	Also direction input
58	CHB8-	Input	Enc 8 Negative B Chan.	Also direction input
59	CHC8+	Input	Enc 8 Positive C Chan.	Index channel
60	CHC8-	Input	Enc 8 Negative C Chan.	Index channel
61	CHU8	Input	Chan 8 U Flag	Hall effect, fault code, or sub-count
62	CHV8	Input	Chan 8 V Flag	Hall effect, fault code, or sub-count
63	CHW8	Input	Chan 8 W Flag	Hall effect, fault code, or sub-count
64	CHT8	Input	Chan 8 T Flag	Fault code, or sub-count
65	USER8	Input	General Purpose User Flag	Hardware capture flag, or sub-count
66	PLIM8	Input	Positive Overtravel Limit	Hardware capture flag
67	MLIM8	Input	Negative Overtravel Limit	Hardware capture flag
68	HOME8	Input	Home Switch Input	Hardware capture flag
69	ACCFLT8	Input	Accessory Fault Flag	For loss of acc supply voltage
70	WD0/	Output	Watchdog Output	Low is PMAC watchdog fault
71	SCLK78+	Input / Output	Encoder Sample Clock	Direction controlled by PMAC2 jumper
72	SCLK78-	Input / Output	Encoder Sample Clock	Direction controlled by PMAC2 jumper
73	ADC_CLK8+	Output	A/D Converter Clock	Programmable frequency
74	ADC_CLK8-	Output	A/D Converter Clock	Programmable frequency

J12 (JMACH4) Machine Connector (Continued)



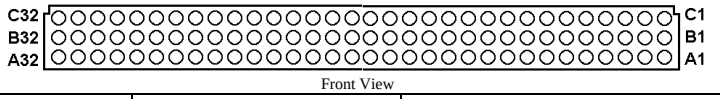
Pin#	Symbol	Function	Description	Notes
75	ADC_STB8+	Output	A/D Converter Strobe	Programmable sequence
76	ADC_STB8-	Output	A/D Converter Strobe	Programmable sequence
77	ADC_DAA8+	Input	Chan A ADC Serial Data	MSB first
78	ADC_DAA8-	Input	Chan A ADC Serial Data	MSB first
79	ADC_DAB8+	Input	Chan B ADC Serial Data	MSB first
80	ADC_DAB8-	Input	Chan B ADC Serial Data	MSB first
81	AENA8+	Output	Amplifier Enable	High is enable
82	AENA8-	Output	Amplifier Enable	Low is enable
83	FAULT8+	Input	Amplifier Fault	Programmable polarity
84	FAULT8-	Input	Amplifier Fault	Programmable polarity
85	PWMATOP8+ DAC_CLK8+	Output	Phase A Top CMD or DAC Clock	Programmable function control
86	PWMATOP8- DAC_CLK8-	Output	Phase A Top CMD or DAC Clock	Programmable function control
87	PWMABOT8+ DAC8A+	Output	Phase A Bottom CMD or DAC A Serial Data	Programmable function control
88	PWMABOT8- DAC8A-	Output	Phase A Bottom CMD or DAC A Serial Data	Programmable function control
89	PWMBTOP8+ DAC_STB8+	Output	Phase B Top CMD or DAC Strobe	Programmable function control
90	PWMBTOP8- DAC_STB8-	Output	Phase B Top CMD or DAC Strobe	Programmable function control
91	PWMBBOT8+ DAC8B+	Output	Phase B Bottom CMD or DAC B Serial Data	Programmable function control
92	PWMBBOT8- DAC8B-	Output	Phase B Bottom CMD or DAC B Serial Data	Programmable function control
93	PWMCTOP8+ DIR8+	Output	Phase B Top CMD or PFM Direction	Programmable function control
94	PWMCTOP8- DIR8-	Output	Phase B Top CMD or PFM Direction	Programmable function control
95	PWMCBOT8+ PULSE8+	Output	Phase B Bottom CMD or PFM Pulse	Programmable function control
96	PWMCBOT8- PULSE8-	Output	Phase B Bottom CMD or PFM Pulse	Programmable function control
97	GND	Common	Reference Voltage	
98	GND	Common	Reference Voltage	
99	+5V	Output / Input	+5V Power	For external circuit or from external supply
100	+5V	Output / Input	+5V Power	For external circuit or from external supply

The JMACH4 connector provides the interface pins for channels 7 and 8. Usually, it is connected to a breakout board, such as one of the Acc-8x family of boards, or an application-specific interface board.

P2A (JMACHB) Alternate Machine Connector

The P2A connector provides an alternate path to J11 and J12 for the machine interface connections for Channels 5-8. Only the positive signals of complementary pairs are brought out on this connector. For the inputs, the complementary lines are tied to 2.5V on PMAC2. Refer to the J11 and J12 pin descriptions for more detailed information on each pin.

P2A/JMACHB (96-Pin Header)



Pin#	Row A	Row B (Format A)	Row B (Format B)	Row C
01	+5V	No Connect	CHU5	+5V
02	GND	No Connect	CHU7	GND
03	CHA5	No Connect	CHV5	CHA7
04	CHB5	No Connect	CHV7	CHB7
05	CHC5	No Connect	CHW5	CHC7
06	PLIM5	No Connect	CHW7	PLIM7
07	MLIM5	No Connect	CHT5	MLIM7
08	HOME5	No Connect	CHT7	HOME7
09	AENA5	No Connect	USER5	AENA7
10	FAULT5	No Connect	USER7	FAULT7
11	PWMATOP5/ DAC_CLK5	No Connect	ADC_DAA5	PWMATOP7/ DAC_CLK7
12	PWMABOT5/ DAC5A	No Connect	ADC_DAA7	PWMABOT7/ DAC7A
13	PWMBTOP5/DAC_STB5	No Connect	ADC_DAB5	PWMBTOP7/ DAC_STB7
14	PWMBBOT5/ DAC5B	No Connect	ADC_DAB7	PWMBBOT7/ DAC7B
15	PWMCTOP5/ DIR5	No Connect	ADC_CLK5678	PWMCTOP7/ DIR7
16	PWMCBOT5/ PULSE5	No Connect	ADC_STB5678	PWMCBOT7/ PULSE7
17	CHA6	No Connect	SCLK5678	CHA8
18	CHB6	No Connect	WD0/	CHB8
19	CHC6	No Connect	CHU6	CHC8
20	PLIM6	No Connect	CHU8	PLIM8
21	MLIM6	No Connect	CHV6	MLIM8
22	HOME6	No Connect	CHV8	HOME8
23	AENA6	No Connect	CHW6	AENA8
24	FAULT6	No Connect	CHW8	FAULT8
25	PWMATOP6/ DAC_CLK6	No Connect	CHT6	PWMATOP8/DAC_CLK8
26	PWMABOT6/DAC6A	No Connect	CHT8	PWMABOT8/DAC8A
27	PWMBTOP6/DAC_STB6	No Connect	USER6	PWMBTOP8/DAC_STB8
28	PWMBBOT6/DAC6B	No Connect	USER8	PWMBBOT8/DAC8B
29	PWMCTOP6/DIR6	No Connect	ADC_DAA6	PWMCTOP8/ DIR8
30	PWMCBOT6/PULSE6	No Connect	ADC_DAA8	PWMCBOT8/ PULSE8
31	GND	No Connect	ADC_DAB6	GND
32	+5V	No Connect	ADC_DAB8	+5V

Detailed pin descriptions for the pins on this connector are given on the J11 and J12 connectors. The P2A connector is just an alternate path for these signals.

Note: Format A for the B-row will be used if jumpers JP1-1 to JP1-32 are removed. This format should be used in a 32-bit VME system. Format B for the B-row will be used if these jumpers connect pins 1 and 2. This format is not compatible with a 32-bit VME system.